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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

A SCIENCE SERVICE PUBLICATION



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April 14, 1928



A GLIMPSE OF THE GRAND CANYON

As Seen from an Army Airplane

(See page 226)

Vol. XIII

No. 386

A FEW years hence we shall see with the eagle's eye the wonders we now view afoot, still earthbound like the mountain goat or the big-horn that returns our gaze from an opposite cliff. In that day sightseeing *will* be sightseeing! We shall scan the waters of Yellowstone Lake as the osprey now scans them. We shall sail over Rainier peak as the high clouds sail over. We shall look downward into the seething kettle of Kilauea as the forgotten gods once looked, in the days when they ruled the skies over Hawaii.

The dream of Daedalus has come true so quickly, and our new wings have grown so fast, that the average citizen, even if he can boast of having "been up" a time or two, still feels slightly dazed and doubtful about it. He has been shaken suddenly out of his sleep, and is not certain whether the soaring portent in the sky is real or a lingering phantasm of the night. If he is old enough to be a trifle gray, he can remember how men mocked at Langley. If he is young enough still to be a little concerned at the way his hair is thinning in front, he can remember how he

himself marvelled at the Wrights. And here is Lindbergh, a grown man and a hero, who can not remember a time when men could not fly!

We shall get over our daze, however. A hundred years ago our great-grandfathers were similarly dazed over their iron horse, and they got over it, and even the prejudiced ones among them soon entrusted themselves and their goods to its swift ministrations. Now that we have a flaming Pegasus tamed for us, it is only a question of getting the creature to multiply until it shall also possess the earth.

Airplane mail and airplane express are commonplace now. Plane passenger traffic is an everyday matter in Europe, and is becoming so with us. Seeing the glories and the wonders of the world from this towering and inspiring point of vantage has not yet been granted to us. But this Army Air Service camera man has given us a foretaste, and we are waiting now, impatiently jingling the ticket-money in our pockets. Make haste, gentlemen, make haste!

Science News-Letter, April 14, 1928

I NTERPRETING week by week, the latest developments in the various fields of science, this magazine attempts also to present its articles in the most pleasing and readable topography and the most convenient arrangement.

The *clippability*, *indexing*, and *automatic dating* of each article are unique features.

This is a *separable* magazine. Each original article can be clipped or torn out without losing or damaging another important article on the other side. These original articles are backed by reprinted quotations or excerpts, short one-sentence items, advertisements, and other material not likely to be clipped and preserved.

Each article is automatically *indexed* by the key word printed in italics just below the heading, or at the end of the article when the article has no heading. Articles can thus be filed easily into any system of classification, whether it be Library of Congress, Dewey, or one of the reader's own devising.

Each article is automatically *dated* by its last line.

All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

An extra supply of this issue and last week's *European Travel Number* of the *Science News-Letter* are provided so that you can send copies to your friends who are planning vacation trips. Send 30 cents (in stamps if you wish) and a memorandum of name and address.

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Botanic Gardens

Botany

Information from Dr. Marshall A. Howe, acting director, New York Botanical Garden.

ARNOLD ARBORETUM, of Harvard University, Jamaica Plain, Mass. Founded in 1870. This covers about 220 acres and contains the largest collection of trees and shrubs of the temperate regions.

MISSOURI BOTANICAL GARDEN, St. Louis, Missouri, established 1889. This included originally about 670 acres, only a part of which has been devoted to the botanical garden itself, the sales and rentals of the remainder furnishing a large maintenance fund, a part of which has been devoted to acquiring a larger supplementary tract at some distance from the city. Floral displays throughout the year are an attractive feature of the institution. It has an herbarium and library and much important research has been accomplished.

NEW YORK BOTANICAL GARDEN, incorporated in 1891, in active operation since 1896. It covers 400 acres in Bronx Park, has extensive greenhouses, a large museum, herbarium and library, and conducts botanical exploration and research in various departments of the plant sciences. It maintains special exhibits of daffodils, tulips, irises, roses, dahlias, etc.

BROOKLYN BOTANIC GARDEN, Brooklyn, N. Y., established 1910, contains an attractive rock garden and a Japanese Garden that has been pronounced the most perfect specimen of the kind in America. The Garden is active in public instruction and in cooperating in the nature-study work of the public schools.

Science News-Letter, April 14, 1928

U.S. National Parks Magnificent Schools

General Science

Prepared by Dr. Frank Thone, Science Service staff writer, formerly Park Naturalist, Yellowstone National Park.

The National Parks of the United States are something more than the greatest system of scenic wonders in the world, something greater than a far-flung group of recreational areas. The person of discerning mind may indeed exclaim in wonder at the towering geysers of the Yellowstone or the awful abyss of the Grand Canyon, he may enjoy hiking over the trails of the Yosemite or fishing in the lakes of Glacier Park; but he does more. He learns. Whether he travels alone or with a university party or follows a local guide, he receives instruction every foot of the way; and that more from the rocks and trees and birds and beasts than from the voice of any human mentor. The National Parks constitute a magnificent national university.

To qualify as a department in this university, a natural feature must, of course, come up to the standards that have been set by the history and traditions of the system. And these, from the very beginning, have been of the highest. The national park idea was born in what is now Yellowstone National Park, and areas candidate for admission to fellowship with it have so far offered natural marvels of their own which have not had to shrink from comparison with so exacting a standard.

Courses of Study

The various departments in this great national university of ours, with the courses of study they offer, may be listed more or less in college catalog fashion:

YELLOWSTONE (Wyoming): Geysers, hot springs and other geothermal phenomena; remarkable development of volcanic and extrusive rocks, geyserite and travertine; origin of rivers flowing to North Pacific, Gulf of California and Gulf of Mexico; Grand Canyon of the Yellowstone, with its magnificent double waterfall; Yellowstone Lake, highest large lake in North America; animals, especially elk, bear, bison, pronghorn, beaver and Yellowstone moose; plants ranging from semi-desert to alpine species, with many interesting ecological situations due to thermal and chemical effects of hot water and steam; birds, including pelicans, sea gulls, ospreys and eagles; many introduced species of trout.

GLACIER (Montana): Splendid display of living glaciers and of glacial work, cirques, ice-eroded canyons, glacial lakes, etc.; stratigraphic phenomena of all kinds, especially the famous Lewis overthrust; animals, especially mountain goats, elk and white-tailed deer; forested valleys, mountain meadows

and the peculiar flora that grows under the edges of glaciers.

MT. RAINIER (Washington): Tremendous extinct volcano, bearing the largest accessible single-peak glacier system; alpine meadows offering probably the richest floral display to be found on this continent.

CRATER LAKE (Oregon): Extinct volcano with crater filled by a lake six miles in diameter, walled in by brilliantly colored lava slides rising 1,000 to 2,000 feet above its surface; many fish in the lake.

LASSEN VOLCANIC (California): The only volcano within the United States proper known to be active; most recent authentically recorded eruption was in 1917, but hot spring and mud geyser activities are more or less continuous.

YOSEMITE (California): A great valley carved by glaciers vanished many millenia ago, and finished by water; now filled with splendid forests and fields of flowers, featuring especially the famous giant Sequoias; bears very numerous, many deer and other animals; above the valley the park runs back into the high Sierras.

SEQUOIA, and GENERAL GRANT (California): Groves of the great *Sequoia gigantea*, largest and oldest of living things. General Grant National Park is a small area (only four square miles) set aside especially to preserve the famous General Grant tree and its companions.

GRAND CANYON (Arizona): The most impressive single spectacle on this planet, a monument of unimaginable grandeur to the power of the weakest thing in the world—water. The Colorado River, flowing through a slowly rising plain for many ages, has cut its channel an inch deeper for every inch the plateau has risen, until it now flows at the bottom of a gorge a mile deep and from seven to thirty miles broad, the walls of which present a cross-section of the geological history of the world clear back to the Archæan.

ZION (Utah): One of the newer parks. An erosional region combining some degree of the magnitude of the Grand Canyon of Arizona with the delicacy of color of the Grand Canyon of the Yellowstone. Unusually fine plant ecology, ranging from southwestern desert to arctic-alpine conditions.

MESA VERDE (Colorado): An abandoned metropolis of the cliff-dwelling Indians, in a region of fantastic beauty; of especial interest to archaeologists.

ROCKY MOUNTAIN (Colorado): Offers a survey of the choicest section of the Colorado Rockies, culminating in Long's Peak; all phases of glacial geology; excellent opportunities for the study of trees at timberline and the flora of alpine meadows; bighorn sheep and other animals; excellent fishing.

HOT SPRINGS (Arkansas): In one sense the oldest national park, having been set aside as permanent public property in 1832; formally designated as a national park in 1921. Hot Springs National Park, as well as the smaller but similar PLATT National Park (Oklahoma), is of interest chiefly as a health resort.

WIND CAVE (South Dakota): Cavern having many miles of galleries and numerous chambers containing peculiar formations.

SULLY'S HILL (North Dakota): The

smallest national park, containing only 11.5 square miles; a wild-animal preserve.

LAFAYETTE (Maine): On Mt. Desert Island; combines granite peaks of Western ruggedness with an excellent display of Eastern flora and fauna; the only national park east of the Mississippi.

GREAT SMOKY MOUNTAINS (North Carolina-Tennessee): Not yet a part of the national park system, but will probably be acquired shortly; unequaled development of the Southern Appalachian flora on mountains lower but much older than the Rockies.

MT. MCKINLEY (Alaska): Remote and relatively inaccessible, but worth the struggle if one has the time; loftiest mountain in North America, 20,300 feet high; an extinct volcano; immense glaciers; herds of caribou and mountain sheep.

HAWAII (Territory of Hawaii): Three separate areas preserve the world's most impressive volcanic areas; Kilauea and Mauna Loa on the island of Hawaii, Haleakala on Maui; also the unique Hawaiian flora and bird population.

A Few Practical Hints

The University of the National Parks is not an institution for capped and gowned dons. Nature, upon intimate contact, is always a bit rough, in spite of the effusions of old-time romantic poets. Stout shoes and old clothes, therefore, are *de rigueur* on this campus. "Sports" clothes are all right for tourists, but on students in good standing close-kneed breeches and snug leggings are both more appropriate and useful than "plus-fours." It is best to come prepared for a variety of weathers, for on mountain heights one day may be warm and the next uncomfortably chilly. Dress as for October, and carry a good sweater-coat or lumber jacket or the like, is perhaps the best summary on the clothes question.

By long odds the best way to travel in the national parks is in your own car. Most of the roads are good, and while some of the grades are steep they are surmounted daily by hundreds of flivvers of a most reverend vintage. It is well to remember, however, that you are often only as safe as your brakebands will keep you. Competent garage service can be had in all of the larger parks.

However, if time does not permit automobile touring, the scientifically inclined visitor can still accomplish a good deal in his one or two weeks by taking one of the railroad-and-bus tours, getting acquainted with the naturalist-ranger he is sure to meet acting as a guide or giving lectures at some point or other, and from him (*Turn to next page*)

U. S. National Parks—Continued

General Science

learning where short hikes will carry him into the most advantageous regions available. If one goes out by rail and undertakes to go through an entire park on foot—a most worthy way to travel, if you really want to see things—two things must be borne in mind: First, don't carry too much equipment, and what you do carry, organize into a back-pack, leaving your shoulders and arms free. Second, have sufficient money in your pocket to assure you of supplies, and of a bed indoors in case of a heavy rain or snowstorm. The National Park Service regards empty-pocketed wanderers, who may think it a lark to depend on others for food and a bed, as hoboes—and they are right.

Automobile tourists also should hold bedding and tentage down to a minimum. About a third of the things one considers necessary at first can be dispensed with. One article, however, may very advantageously be added, even though it is not indispensable. That is a portable gasoline stove. In many of the more frequented camps in the parks firewood is provided, but sometimes the supply runs short. And when it rains, a wood fire is decidedly the opposite of the cheerful creature we usually conjure up in its name. Moreover, use of such a stove will reduce the forest fire risk, for which the rangers will call you blessed.

A Few Don'ts

Don't take any chances with fire! Rangers, whether National Park, Forest Service, or State, are convinced believers in Hell. Many of them have seen it. Don't just throw your cigarette butt down and grind your heel on it; unroll it and rub out every spark with your fingers. Don't throw away a burned match until it is dead cold; the rangers' rule is to break every match in three pieces. Best swear off smoking altogether while you are in the woods if you can stand it. Don't build a fire on "duff," or where there are any roots around; bare sand or earth or bald rock are the only suitable places for fires. Don't leave your camp until at least a half hour after you are sure the fire is completely out. Drench it with buckets of water, or if water is not available, bury it under plenty of dirt.

Don't carry any firearms. They'll only be sealed at the park entrance, and you lose the gun and a stiffish fine besides if you tamper with the seal.

Don't bring your dog. Loose dogs would chase the native animals; and if one of the animals happened to be a bear you might be minus a dog. Park rules, therefore, require all dogs to be kept on a leash during every minute of their stay, and for a decent dog that's a dog's life. So leave him at home.

Don't fraternize with bears. Most of the bears are quite amiable and harmless—if you toss your candy or other tidbit to a safe distance. Bears, as a rule, mean no mischief, but they are exceedingly stupid and gigantically strong, and a mere gesture of impatience on their part can easily cripple or kill a man.

Don't call a National Park Ranger a Forest Ranger, or *vice versa*. They are two quite distinct services, and each man is proud of his own "outfit," like the U. S. Army and the U. S. Marines.

Reading Up on the Parks

A literature of considerable size has grown up around our national park system, and it will be profitable for the prospective visitor to acquaint himself with such parts of it as have to do with the particular parks he intends to visit. The U. S. National Park Service issues a booklet about each of the parks. These are formally styled *Rules and Regulations*, but in reality are brief guides and general information books as well as compendiums of the rules governing the parks. They are distributed free of charge. To obtain the desired copies, one writes to The National Park Service, Department of the Interior, Washington, D. C., naming the parks one intends to visit and requesting copies of *Rules and Regulations* for those particular parks. Each of these Rules and Regulations booklets contains, in its back pages, a complete bibliography of the literature on its own particular park as well as on the national parks in general, listing both government and privately printed books and articles.

Science News-Letter, April 14, 1928

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A "Little Yellowstone"

Volcanology

The geysers of an almost unknown "Little Yellowstone" are wasting their spouting on the desert air of Nevada, according to Mrs. Beirne B. Brues of Boston. In company with her husband, Prof. C. T. Brues of Harvard University, Mrs. Brues last summer motored over much of the desert and semi-arid country in Utah, Nevada and California, and in the course of their travels they came upon this little patch of erupting hot springs, which she states resemble the geysers of Yellowstone National Park in their action and in the geological formation of their craters.

The geyser area lies a little distance off the Victory Highway (U. S. 40) between Salt Lake City and Reno. Leaving the highway at Dunphy, Nevada, a small railroad section station 56 miles west of Elko, Nevada, one travels south for a few miles along the Humboldt river to the town of Beowawe, Nevada. The geysers are situated a few miles south of that town, on a shelf on a mountain side. The white patch made by their deposits is visible from Emigrant Pass, 35 miles west of Elko, and remains in sight practically all the rest of the way to Beowawe.

The geyser shelf on the mountain-side is part of a private ranch, but visitors are welcome. The formation totals about half a mile in length. In the course of half an hour several of them will erupt, some to a considerable height.

So far as is known, these are the only geysers in the United States outside of Yellowstone National Park, which contains more active geysers than all the rest of the world put together. Other famous geyser regions are found in Iceland, where these peculiar erupting hot springs received their name, and in New Zealand.

Science News-Letter, April 14, 1928

A newspaper printed in the native language of Hawaii since 1861 is now about to be discontinued.

The return of salmon to their home waters can be predicted almost to a day for years in advance.

Chicago's new aquarium is to have salt water sent from the sea for its salt-water fishes to swim in.

Beaver liver is almost as good for eating purposes as the liver of chickens, a biologist states.

Naturalists' Paradise in National Forests

General Science

The Forest Service, U. S. Department of Agriculture, Washington, D. C., will gladly furnish free to all applicants printed matter describing the vacation advantages of the National Forests.

He who would seek the woods in summer, either to commune with nature as a poet or to extract her secrets as a student, would do well to direct his steps (or, more modernly, his front wheels) toward the national forests. The national and state parks are often better known and hence more readily thought of, but the forests have certain advantages which the naturalist will be quick to see.

In the first place, there are a great many more of them. They cover scores of times as much area as the national parks and the state parks put together. They run off into more inaccessible places, thus insuring to the student the solitude which he usually needs for successful work. There are a number of extensive national forests in the East, whereas all but one of the national parks are west of the Mississippi; hence persons living in the East and not having time for the long journey across the prairies and plains can more readily reach a territory where they can work. Nor need one forego the magnificences of the national parks altogether if he elects to conduct his field work in the western national forests. All of the more important national parks lie in a matrix of national forests, like a nucleus in its cytoplasm, so that passage from the one to the other is short and easy.

Important for geologists, botanists and entomologists is the fact that for obvious reasons collecting of specimens can not be permitted in the tourist-crowded national parks, and usually not in the state parks,



IN THE NATIONAL FORESTS there are unparalleled opportunities for the study of natural history, as well as for "just hiking," camping and fishing.

except under specially granted permits, which are not always easy to get. Such restrictions are not needed in the less frequented forests, so that one may bring back a full rucksack or vasculum or collecting bottle without fear and without reproach.

Equally important for mammalogists and ornithologists is the fact that the birds and animals in the national forests are on the whole easier to find than they are in the more crowded national parks. There most of them avoid the tourist tracks

during the season, and their behavior is to that extent modified. In the forest our shy brethren in feathers and fur may be approached with the benefit of more complete silence behind one, and with less nervousness on their own part.

Finally, it may be mentioned that for ichthyologists, both pure and applied, the streams and lakes in the national forests are kept stocked with most excellent fish.

Science News-Letter, April 14, 1928

Sisters of the National Parks

General Science

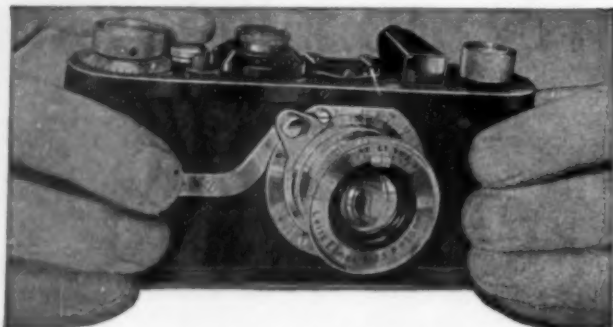
Adapted from *Glimpses of our National Monuments*. This publication can be obtained upon application to the National Park Service, Department of the Interior, Washington, D. C.

Someone has defined National Monuments as "National Parks that have not yet grown up." That would seem to be about as close as it might be possible to come to an inclusive description of this heterogeneous group of areas preserved and protected by the United States Government. For national monuments are scattered all over the country

and include all kinds of things, from actual bronze monuments in the ordinary sense to great areas quite up to national park standards in scenic, scientific or historic interest, which await only sufficient funds for the proper administration and development, or the building of better roads to make them accessible, for a change to full national park status. Some of the smaller national monuments, of course, will probably never

become national parks; though it must be remembered that Hot Springs National Park, one of the best known and the oldest in point of time, has an area of only one and one-half square miles.

The only really sharp line that can be drawn between national monuments and national parks is a legal one: A national monument may be created by Presidential proclamation, whereas it (Turn to next page)

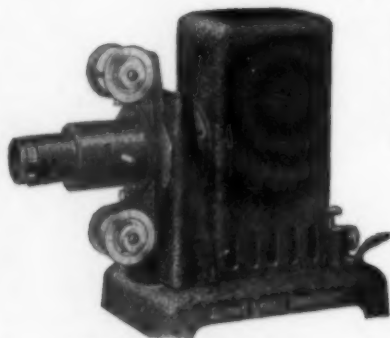


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National Monuments—Continued

requires an act of Congress to create a national park, either *de novo* or out of a previously existing national monument. Whereas all the national parks are administered by the National Park Service, which is a bureau of the Department of the Interior, the administration of some of the national monuments is turned over, as a matter of convenience and economy, to the Department of Agriculture and the War Department.

A full list of the national monuments, with a brief description of each one, is given in the Government publication cited at the head of this article, *Glimpses of our National Monuments*. The following selections from this list will give some idea of the geographical distribution, as well as of the range in interest, of these reservations:

Devil's Tower (Wyoming): Remarkable rock tower, 1,200 feet in height; a vast mass of columnar lava.

Petrified Forest (Arizona): Best-known group of petrified trees in the world, and one of the largest.

Tumacacori Mission (Arizona): Early 17th-century Franciscan mission; being restored by the National Park Service.

Rainbow Bridge (Utah): One of the largest and most striking natural stone arches known.

Dinosaur (Utah): Enormous deposits of fossil dinosaur bones.

Carlsbad Cave (New Mexico): Limestone caverns of extraordinary size and remarkable beauty; interesting cave fauna.

Craters of the Moon (Idaho): Weird volcanic region containing remarkable fissure eruption, together with its associated volcanic cones, craters, lava flows, caves, natural bridges and other phenomena.

Mount Olympus (Washington): Glaciers; montane flora and fauna, especially the Olympian elk.

Bryce Canyon (Utah): Box canyon filled with countless array of vividly colored pinnacles.

Mound City Group (Ohio): Famous group of Indian mounds in Camp Sherman military reservation.

Fort Marion (Florida): Oldest military structure in this country; built by the Spaniards in 1656.

Fort Wood (New York): Only one acre in extent, it is the smallest of our national monuments, but nevertheless the best known; it is the site of the Statue of Liberty.

Science News-Letter, April 14, 1928

Twenty states have passed enabling legislation for city planning and zoning in incorporated cities.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Science News-Letter, published weekly at Baltimore, Md., for April 1, 1928.

District of Columbia—ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Watson Davis, who, having been duly sworn according to law, deposes and says that he is the Managing Editor of the Science News-Letter and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—Watson Davis, 21st and B Sts., Washington, D. C.

Editor—Watson Davis, 21st and B Sts., Washington, D. C.

2. That the owner is: Science Service, Inc., 21st and B Sts., Washington, D. C. A non-profit making corporation and scientific institution.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. (Signed) Watson Davis.

Sworn to and subscribed before me this 29th day of March, 1928.

(SEAL) Charles L. Wade.

(My commission expires May 3, 1928.)

Science News-Letter, April 14, 1928

Another Petrified Forest?

Palaeobotany

Some time ago reports were rife of the existence of a great petrified forest in *Brewster County, Texas*. They were greeted with considerable skepticism.

But now comes Howard A. Epperson of Martha, Texas, who in a letter written to the U. S. Forest Service and quoted in *American Forests*, declares that he has visited the region and seen the fossil trees, and that in company with the late George B. Sudworth.

Mr. Epperson says that he and Mr. Sudworth estimated the largest stump they found to be over 40 feet in diameter where it projected through the volcanic ash, and that they believed its roots were buried 150 to 200 feet below that point.

"I would very much like to see or help to make a more comprehensive survey of this locality," he says.

This would seem to furnish a challenge to any young geologist to travel down into that country with tape-measure, notebook and camera, and settle the question of that forest once and for all.

Science News-Letter, April 14, 1928

What Geology to See and Where

Geology

Prepared by U. S. Geological Survey, Department of Interior, Dr. George Otis Smith, director.

No matter where the traveler journeys, he can not avoid seeing geology. But some of the landscapes viewed from automobile or train window will be meaningless to untrained eyes. The purpose of the following brief guide to locations where interesting geological features can best be seen is to allow the scientifically-inclined explorer of modern America to benefit from the information and skill of the government geologists.

Glacial Features

Part of America was once covered with great ice sheets which have left their mark on the land as seen today. The geological features created by these glaciers include:

DRUMLIN—(1) There is a large area in Wayne, Cayuga and Onondaga counties, New York, in which every lenticular hill is a drumlin, made by the heaping together of glacial till underneath the ice sheet. This region has an area of about 1,100 square miles, extending from near Baldwinsville on the east to Palmyra on the west. The drumlins are well shown on the following contour maps of this Survey: Sodus Bay, Oswego, Fulton, Macedon, Palmyra, Clyde, Weedsport, Baldwinsville, Phelps, Geneva, and Auburn. (2) A large area lying northeast of Madison, mainly in the counties of Dodge and Jefferson, Wisconsin. This area has not been covered with contour mapping, but some of the drumlins are well shown on the Sun Prairie, Koshkoning, Waterloo, Watertown, and Hartford atlas sheets. These drumlins are also described and shown on a general map in Professional Paper 106, U. S. Geological Survey, which can be found in most large libraries. (3) Drumlins are also abundant in Massachusetts, but they are here more scattered than in the regions already mentioned. Their distribution in the State is shown in Bulletin 760, of the U. S. Geological Survey.

MORaine—Ridges of clay, sand, and gravel that mark certain places where the ice sheet remained stationary for a great length of time are found in many places in the northern part of the country, but they are only typically developed at a few places, some of which are as follows: (1) A well marked moraine lies a few miles southeast of Whitewater, Walworth County, Wisconsin. This moraine

trends northeastward from the point mentioned above, to the town of Palmyra, Jefferson County. The northwestern front of the moraine is abrupt and extremely irregular where it marked the contact with the great glacier that lay to the northwest. (2) There are many moraines excellently shown in the valley of the Arkansas River, between Buena Vista and Tennessee Pass, Colorado. These moraines are built by local glaciers that came down from the Wasatch Range on the west. The moraines are most pronounced at Clear Creek, Twin Lakes, and Lake Fork, the latter lying just west of Leadville. (3) There is a moraine excellently exposed at Pando in the valley of Eagle River just north of Tennessee Pass. The auto road crosses this moraine 5 miles south of Red Cliff.

ESKER—These long, narrow, and generally straight ridges are supposed to have resulted from the filling of stream channels under glaciers. (1) The most pronounced eskers are in Maine, but they are fairly common in the northern New England region. The longest eskers known are in the Passadumkeag region of Maine in the vicinity of Penobscot River. Some of these are 15 to 18 miles in length and can readily be seen, as the roads are built on their tops. These eskers are well shown on the Passadumkeag atlas of the U. S. Geological Survey. (2) A well marked esker may be seen in Oxford County, Maine, in the valley of Barkers Brook north of Bryant Pond. This is represented on the Bryant Pond Atlas sheet of the U. S. Geological Survey. As a road follows this esker it can easily be seen. (3) An esker of considerable length can be seen on the west side of Lake Champlain in the extreme northern part of New York. This esker has a length of about 10 miles and roads generally are located on its crest so that it can be readily seen. It is shown on the Rouses Point atlas sheet just west of Chazy.

GLACIAL CIRQUE—Glacial Cirques are developed only in mountainous regions and consequently they are to be found in their best development in such places as the Rocky Mountain National Park, Glacier National Park, and Yosemite National Park. Glacial cirques are most easily reached directly west of Denver. The best ones in this region are located at the

base of Mount Evans and these may readily be seen in the summer time from the auto road which ends at Summit Lake. This lake and also Chicago Lakes occupy rock basins scooped out by the glaciers which originated in these cirques. The cirques are shown on the Geological Survey contour map of the Denver Mountain Parks.

Volcanic Features

VOLCANIC STOCK—Volcanic stocks, necks, or plugs, as they are variously named, are masses of volcanic material that cooled and hardened in the throat of volcanoes. After the softer rocks have been eroded, they stand up as towering masses of hard rocks or long fingers pointing upward. (1) One of the most prominent volcanic stocks is Mount Taylor, about 15 miles east of Bluewater on the Santa Fe Railroad, in Valencia County, New Mexico. (2) Many volcanic stocks occur in the region north of Holbrook, Arizona, in Navajo County. These are scattered widely over the desert region and can be reached only with considerable difficulty. (3) Many volcanic stocks are present in northwestern Colorado, the most prominent and most easily reached of which are those in the vicinity of the village of Yampa on the Moffat Railroad, 25 miles south of Steamboat Springs.

CINDER CONES—Cinder cones or volcanic cones built up of loose material, are common in many places in the West. (1) Some of the most easily accessible cones are those in the vicinity of Flagstaff, Arizona. The most perfect of these are Mt. Wing and Walker Lake, northwest of Flagstaff. These are shown on the map of the Flagstaff quadrangle. (2) About 25 miles south of Owens Lake in Inyo County, California, is a very perfect cinder cone that can easily be reached from the auto road from Mohave to Keeler.

RECENT LAVA FLOW—(1) A very recent lava flow can be seen on the road from Mohave to Keeler, California, just to the south of the cinder cone noted above. This is so easily accessible from the auto road that a traveler passing this way would have little difficulty in seeing the flow. It is in plain sight of the road for many miles. (2) A small but very interesting lava flow can be seen on Eagle River, Eagle County, Colorado, just above the junction of the Eagle River with the (Turn to next page)

What Geology to See—Continued

Colorado. This is about 5 miles below the town of Gypsum. It can be seen from the auto road and also from the trains of the Denver and Rio Grande Western Railroad.

DIKE—Dikes of hardened lava that has been forced up through some crack in the rocks are quite abundant, but few of them are large enough or hard enough to make much of a showing. (1) The largest dike in the country is one of a great system of dikes that ray out from the Spanish Peaks in Las Animas County, Colorado. The largest of these extends northward from West Spanish Peak along the west side of Guajaytoyan Creek to within 4 miles of the village of La Veta on the La Veta branch of the Denver and Rio Grande Western Railroad. This dike has the appearance of a great rock wall which in places is more than 100 feet high.

COLUMNAR LAVA—Some masses of molten rock on cooling develop a wonderful system of hexagonal prisms, perpendicular to the cooling surface. (1) Two notable examples of columnar structure may be seen in northeastern Wyoming. One of these is the Devil's Tower, 25 miles northeast of Moorcroft and the other is called Inyankara, 30 miles east of Moorcroft. (2) There are many features of this kind in the lava fields of Washington. One is at Cactus Siding, 5 miles south of Connell on the Northern Pacific Railway and another is in Yakima Canyon a few miles north of North Yakima.

Economic Materials

LARGE COAL BED—Coal beds are of such common occurrence that few stop to consider them, largely because they are rarely exposed in full thickness. A few localities will be given where the full thickness of the bed may be seen. (1) The full thickness and character of the celebrated Pocahontas No. 3 coal bed has been preserved at the type locality, Pocahontas, Tazewell County, Virginia, and can be readily seen without difficulty. The coal bed is nearly 11 feet thick and contains as fine steaming coal as any other coal bed in the world. (2) A coal bed 20 feet thick can be seen at Streator, about 12 miles northeast of Meeker, Rio Blanco County, Colorado, on the main road leading from Meeker to Craig. (3) Perhaps the most remarkable exposure of coal is to be seen in a strip pit which has recently been opened by the Northern Pacific Railroad Company in sec. 35, T. 2 N., R. 41 E.,

about 25 miles due south of Forsyth, Montana. This coal bed is 27 feet thick and the whole amount is mined or quarried with steam shovels.

SALT CRUST—The salt crust of Death Valley, Inyo County, California, is a very interesting feature, though it has not yet been used in a commercial way. This field of salt is 2 or 3 miles wide, 10 or 15 miles long and consists of a crust of salt several feet thick. The salt is very impure and it forms in pinnacles several feet high which make it difficult to cross, except where the pinnacles have been beaten down into a road. Any road leading to the Furnace Creek Ranch in the northern part of the valley will bring the visitor to this salt field.

OIL SHALE—Most persons are interested in the great reserves of oil shale which have been reported in several of the western states, but few have any idea of the appearance or character of these shales. The best place to see them is at Grand Valley, Garfield County, Colorado. Here the cliffs of oil shale are near the railroad and the auto highway and the shale can readily be examined. Most persons think of oil shale as containing oil, but on these shales he will see no signs of oil. In fact the oil can be obtained only by the distillation of the organic material that causes the shale to have a dark color.

Geologic Structures

ANTICLINE—Anticlines are great arches in the rock; these may be very elongate and are then called arches or may be as broad as they are long and when of such a shape are called domes. (1) Arches in the rocks are very common in the Appalachian region. One of the best of these and at the same time one that is easily accessible is just west of Cumberland, Maryland. This great anticline in massive sandstone has been cut by Willie Creek until the complete section of the arch is exposed. (2) Another anticline that is equally well known and accessible is the sandstone arch at the Iron Gate just east of Clifton Forge, Virginia. (3) The celebrated Teapot Dome oil field north of Casper, Wyoming, is a dome-shaped anticline, but the structure is not apparent at the surface as the rocks are too soft to preserve the dome. The adjacent oil field—Salt Creek field—is a slightly irregular dome outlined by the Rim Rock which once arched up and covered the entire structure. These fields are easily accessible and will well repay a visit.

Geological Guidebooks

Geology
These publications are out of stock for free distribution, but can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Bulletin 611, Guidebook of the western United States, Part A, The Northern Pacific Route, with a side trip to Yellowstone Park, by M. R. Campbell and others, \$1.00.

Bulletin 612, Guidebook of the western United States, Part B, The Overland Route, with a side trip to Yellowstone Park, by W. T. Lee, R. W. Stone, H. S. Gale, and others, 50 cents.

Bulletin 613, Guidebook of the western United States, Part C, The Santa Fe Route, with a side trip to the Grand Canyon of the Colorado, by N. H. Darton and others, \$1.00.

Bulletin 614, Guidebook of the western United States, Part D, The Shasta Route and Coast Line, by J. S. Diller and others, 50 cents.

Bulletin 707, Guidebook of the western United States, Part E, The Denver & Rio Grande Western Route, by M. R. Campbell, \$1.00

Science News-Letter, April 14, 1928

Of Taming Dragons

Volcanology

In Sonoma County, California, near the town of Cloverdale, there is an industrial development, unique in this country and one of only two enterprises of its kind in the world, that will repay a brief visit by physicists, engineers and geologists. It is the effort to carry out the ancient and much-talked-of project to capture and utilize natural heat under the surface of the earth.

At "The Geysers" the effort is, to be sure, a fairly modest one. There is nothing here of the ten-mile-deep shaft talked about by Professors of Romantic Engineering, no effort at a Vernian or Wellsian tunnel through the earth. The promoters of this enterprise are contenting themselves with drilling into a place where the heat has accommodately come near to the surface, in the form of hot springs, and leading up the steam they find in casings not unlike those employed in oil or artesian wells. They declare their wells are working, and that they will pay. "The Geysers" is worth looking at, anyway.

The scientific aspects of the enterprise have been studied by Dr. E. T. Allen and Dr. A. L. Day, and are reported under the title *Steam Wells and Other Thermal Activity at "The Geysers," California*, published by the Carnegie Institution of Washington.

Science News-Letter, April 14, 1928

State Parks Increasing Rapidly

General Science

Based on material furnished by Beatrice M. Ward, executive secretary of the National Conference on State Parks, Washington, D. C.

The rise in the purchasing power of the average citizen, together with his increasing appreciation of the beauties of nature and the fascination of historic spots, mechanically mobilized by the development of the automobile, have created a demand for outdoor areas for recreation and nature study on a scale wholly unimaginable in the days of our immediate ancestors. The crowds now awheel pour through our national parks like a flood; they would swamp them utterly if there were not other places available to take care of the overflow.

Conceived at about the same time as the national parks idea, the state park movement is rapidly outstripping its companion system. There are now over 500 state parks, distributed through 43 of the 48 states. In the West, where example has been set by national parks and monuments, the states are emulating the national government; in the East, where there are fewer areas that measure up to the exacting national park standard in scenic grandeur or scientific value, there are abundant smaller beauty-spots, and these the

states are insuring to the use of their people for all time.

Where the desirable area lies across state boundaries, or where the people of one state will receive unusual benefits from a park to be established in a neighboring state, we hear of voluntary interstate co-operation, instead of the demand that might have arisen a few years ago for the intervention of the federal government and the establishment of a national park. Cases in point may be seen in the Palisades Interstate Park in the New York City area, in the Dunes Park of northern Indiana, in the area around McGregor, Iowa, and Prairie du Chien, Wisconsin. Action between states may take longer to consummate than would action by single state governments or by the federal government, and an interstate park may be held in the offing for several years. But where the situation calls for such an establishment, it is preferable to exercise the necessary patience until it can be taken.

It is desirable, if possible, to plan a journey through several state parks in the same natural series. One will thus be enabled to develop an idea of the geological events that led

up to their development, and to trace the history of the migration of plants and animals by lingerers in the depths of ravines and the corners of canyons of species whose main armies may now be scores or hundreds of miles away.

One magnificent series of state parks and of sites that will some day be state parks was provided for the people of today by the massive glaciers that oppressed the north-eastern segment of this continent ages ago. When this ice came, it pushed ponderous fingers down many already existing rocky valleys, scouring them deeper, and piling up the detritus into natural dams at their lower ends, so that when it melted it left beautiful little lakes behind. Farther west, the rapid melting of the ice gave birth to many rushing, rock-tumbling torrents. These chiseled deep canyons whose cliffs still survive, surprising one with bits of mountain scenery sunk, intaglio-fashion, into the quieter and more placid beauty of the prairies. As random examples of this megalithic sculpturing of the early post-Pleistocene, mention may be made of the Sugar Grove region in (Turn to next page)

Zoological Gardens of America

Zoology

Information from Dr. W. M. Mann, director of the National Zoological Park, Washington, D. C.

In the following cities of the United States and Canada there are zoological gardens that may be visited by the scientific traveler:

ANACONDA, MONTANA: Washoe Park; municipal.

ATLANTA, GEORGIA: Grant Park.

AUBURNDALE, MASS.: Norumbega Park; 1898.

BALTIMORE, MARYLAND: Druid Hill Park; municipal.

BOSTON, MASS.: Franklin Park; 1912; municipal.

BROOKLYN, N. Y.: Prospect Park; municipal.

BUFFALO, N. Y.: The Park; 1895; municipal.

BUTTE, MONTANA: The Gardens; commercial.

CEDAR RAPIDS, IOWA: City Park; 1908.

CINCINNATI, OHIO: 1875; commercial.

CHICAGO, ILL.: Lincoln Park; municipal.

CLEVELAND, OHIO: Wade Park; 1893. Brookside Park; 1908.

COLUMBUS, OHIO: Olentangy Park; commercial.

DAVENPORT, IOWA: Fizerary Park; 1910; municipal.

DENVER, COLO.: City Park; municipal.

DES MOINES, IOWA: Grandview Park; municipal.

DETROIT, MICHIGAN: Belle Isle Park; municipal.

KANSAS CITY, MISSOURI: Swope Park; 1908; municipal.

LAFAYETTE, IND.: 1911; municipal.

LEXINGTON, MASS.: Lexington Park; 1903.

LOS ANGELES, CAL.: Eastlake Park; municipal; Wild Animal Farm; commercial.

MEMPHIS, TENN.: Overton Park; 1908; municipal.

MILWAUKEE, WISCONSIN: Washington Park; 1905.

MINNEAPOLIS, MINNESOTA: Longfellow Gardens; commercial.

MUNCIE, IND.: 1911; municipal.

(Turn to next page)

American Museums

General Science

Nearly every American city of any size has a science museum of some sort, connected with an educational institution or the result of local initiative. Out of the many the following have been selected as being those most likely to interest the traveler. For a complete list, see "Museums of the United States," issued by the American Association of Museums, Smithsonian Institution Building, Washington, D. C. (50c).

HOLBROOK, ARIZ.—Petrified Forest National Monument Museum.

ALDER CREEK, CALIF.—Sequoia National Park Museum.

LOS ANGELES, CALIF.—Los Angeles Museum; Southwest Museum.

SAN DIEGO, CALIF.—San Diego Society of Natural History, Museum of Natural History; San Diego Museum.

SAN FRANCISCO, CALIF.—California Academy of Sciences Museum; Steinhart Aquarium.

SANTA BARBARA, CALIF.—Santa Barbara Mu- (Turn to next page)

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Museums—Continued

seum of Natural History.

YOSEMITE, CALIF.—Yosemite National Park Museum.

DENVER, COLO.—Colorado Museum of Natural History.

NEW HAVEN, CONN.—Yale University Peabody Museum of Natural History.

WASHINGTON, D. C.—National Academy of Sciences; U. S. National Museum.

CHICAGO, ILL.—Field Museum of Natural History.

SPRINGFIELD, ILL.—Illinois State Museum.

DAVENPORT, IOWA—Davenport Public Museum.

BOSTON, MASS.—Boston Society of Natural History.

CAMBRIDGE, MASS.—Museum of Comparative Zoology; Peabody Museum of Archaeology and Ethnology.

ANN ARBOR, MICH.—University of Michigan Museum of Zoology.

GRAND RAPIDS, MICH.—Kent Scientific Museum.

MINNEAPOLIS, MINN.—University of Minnesota Zoological Museum.

ST. LOUIS, MO.—Educational Museum of St. Louis Public Schools.

NEWARK, N. J.—The Newark Museum. (Turn to page 236)

Zoological Gardens—Continued

NEWARK, NEW JERSEY: Commercial.

NEW YORK: Central Park; 1865; municipal.

NEW YORK: Zoological Park (Bronx Park); 1898; society.

OKLAHOMA CITY, OKLAHOMA: Wheeler Park; 1908.

OMAHA, NEBRASKA: Riverview Park; municipal.

PHILADELPHIA, PENNA.: Fairmount Park; 1859; society.

PITTSBURGH, PENNA.: Highland Park; municipal.

PORTLAND, OREGON: City Park; 1899; municipal.

PROVIDENCE, RHODE ISLAND: Roger Williams Park; municipal.

PUEBLO, COLORADO: City Park; municipal.

READING, PENNA.: 1911; municipal.

ROCHESTER, N. Y.: Seneca Park; municipal.

ST. JOSEPH, MISSOURI: Krug Park; municipal.

ST. LOUIS, MISSOURI: Forest Park; municipal.

ST. PAUL, MINNESOTA: Como Park; municipal.

State Parks—Continued

Ohio, Turkey Run in Indiana, Starved Rock in Illinois, The Dells in Wisconsin and Steamboat Rock and the Boone Ledges in Iowa. Indeed, one may even ambitiously claim the Grand Canyon of the Yellowstone as a part of this series, for its carving was begun at the same time and in much the same way. There are many other beads on this chaplet of natural jewels which the glaciers carved for us, some of which are in all likelihood only waiting exploration by a real nature enthusiast to be lifted out of the slough of local indifference to the pride of the State Park sisterhood.

The exploration suggested in the foregoing paragraph is only one of the many that might be made, either in state parks already established or in areas worthy of designation as units in the series. There is no state in the Union so thickly settled or so little favored by nature that will not afford the thrill of discovery and the surprise of beauty suddenly revealed to the seeker.

Science News-Letter, April 14, 1928

A new kind of glass that resists sudden changes in temperature is being used for bobbins in silk mills.

SALT LAKE CITY, UTAH: Liberty Park; municipal.

SAN ANTONIO, TEXAS: San Pedro Park; 1871; commercial.

SAN FRANCISCO, CAL.: Golden Gate Park; municipal.

SEATTLE, WASHINGTON: Woodland Park; municipal.

SPOKANE, WASHINGTON: Manito Park; municipal.

SPRINGFIELD, MASS.: Forest Park; municipal.

TACOMA, WASHINGTON: Fort Defiance Park; municipal.

TOLEDO, OHIO: Otway Park; 1900; municipal.

TROY, N. Y.: Zoological Park; municipal.

WASHINGTON, D. C.: National Zoological Park; 1890. Smithsonian.

WICHITA, KANSAS: Riverside Park; municipal.

TORONTO: High Park; municipal.

TORONTO: Riverdale Park; about 1900; municipal.

VANCOUVER: Stanley Park; municipal.

Science News-Letter, April 14, 1928

Visiting Mt. Lassen

Volcanology

Mt. Lassen National Park is one of the newer and less accessible of our national parks. R. H. Finch, volcanologist, who is stationed at Mineral, Calif., to keep track of the activities of the only "live" volcano within the United States proper, tells how it may be reached.

Coming from the East by automobile, one should turn from the Lincoln Highway and head for the Susanville-Red Bluff Highway. From this one can turn off for Drakesbad, which is in a solfataric area. Thence one can go by horseback to the foot of Mt. Lassen. Another horseback trip from Drakesbad is to Cinder Cone and its latest lava flow, which is the youngest in the United States, having occurred about 1851. Another point on the above highway, from which one can drive to within hiking distance of Mt. Lassen, is Mineral, where the National Park Service maintains its headquarters.

Coming from the West the most common place for leaving the Sacramento Valley is Red Bluff, over the excellent Red Bluff-Susanville Highway. The northwest entrance to Lassen National Park may be reached by a fair highway from Redding. The northeast entrance to the park, near which is Cinder Cone, may be reached by motorists who are not afraid of sand.

Science News-Letter, April 14, 1928

Among Indians Of Today

Ethnology

Information from the Office of Indian Affairs, Department of Interior, Washington, D. C.

Once the Indians owned all of America. Today their descendants aided by Uncle Sam are making their contribution to American progress and doing their part in adjusting themselves to white man's civilization. Interesting scientific work among the Indians may be seen at:

The nonreservation schools for Indians, at Salem, Ore., Riverside, Calif. (Sherman Institute), Phoenix, Ariz., Albuquerque and Santa Fé, New Mexico, Genoa, Nebr., Lawrence, Kan. (Haskell Institute).

The Menominee Timber Project, Wisconsin.

Experimental date gardens at Martinez and Palm Springs, Mission Agency, California.

Experimentation work on Indian agency and school farms, instructing Indians as to diversifying their products, carried on in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture.

The growing of long staple Egyptian Cotton, supplying high grade tested seed, at Pima agency, Sacaton, Arizona.

Science News-Letter, April 14, 1928

Landmarks of Ancient America

Archæology

Prepared by Neil Judd, archaeologist of the U. S. National Museum, who has excavated Pueblo Bonito and other American ruins.

Those who inhabited America long before the white man have left evidence of their life and cities in archaeological ruins now studied by scientists and viewed by interested tourists.

CAHOKIA MOUND GROUP—Madison County, Illinois, 6 miles east of St. Louis, Missouri, and most easily reached from St. Louis. The principal mound is the largest prehistoric artificial earth-work in the United States; it measures 998 by 721 feet, is 99 feet high and contains over 21 million cubic feet of earth.

ETOWAH MOUND GROUP—Bartow

County, Georgia, 3 miles southeast of Cartersville. The principal mound is 380 by 330 feet and 61 feet high. The Indian village formerly here is supposed to be the Guaxule of De Soto's chronicles. Brief descriptions of both the Cahokia and Etowah groups with biographies are found in the Handbook of the American Indian, Bulletin 30, Bureau of American Ethnology.

PUEBLO BONITO—In Chaco Canyon, New Mexico, Northwestern New Mexico. Largest of several great ruins representing the highest civilization of Pueblo peoples in prehistoric times. Pueblo Bonito has been excavated by the National Geographic Society. (See *National Geographic Magazine* for September, 1925). It is most easily reached by auto from Gallup, New Mexico.

INSCRIPTION ROCK (El Morro)—35 miles east of Zuñi pueblo, Valencia County, New Mexico. A favorite camping place for the Spanish Conquistadores on the old trail from Zuñi to the Rio Grande pueblos. It served as a stone autograph album for the conquerers and later pioneers, of whom Juan de Oñate was the first to carve his name, in 1605. Reached by auto from Gallup, New Mexico.

CANYON DE CHELLY and its tributary, Canyon del Muerto. About 65 miles northwest of Gallup, New Mexico, and best reached from there by auto. This canyon, of surpassing beauty and picturesqueness, contains many ancient cliff dwellings and the remains of still older peoples; it is now inhabited by scattered families of Navajo. In favorable season those familiar with the Canyon can reach most of the ruins by auto; by wagon or horseback is a slower but more certain means of locomotion. Competent guides are essential.

HOPÍ PUEBLOS—In northeastern Arizona, reached by auto from Winslow, Arizona, or Gallup, New Mexico. Most conservative of modern Pueblo villages; in large part, direct descendants of ancient cliff-dwellers. Their various ceremonies, especially the Snake Dance of late August, are among the most dramatic of the Indian ceremonies still presented.

CASA GRANDE—9 miles southwest of Florence, Pinal County, Arizona, best preserved of the southern Arizona prehistoric ruins, it was visited by Fray Eusebio Kino in 1694.

PECOS PUEBLO—30 miles south-east of (Turn to next page)



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Part II, which likewise applies in the United States, contains more detailed information than Part I. It should be particularly helpful to those who are studying astronomical text books.

Part III treats particularly of those parts of the sky which are not seen from the United States. Readers of Part II and of Part III are supposed to be familiar with the preceding parts.

The Conclusion gives a list of books on astronomy for those who wish to do more reading.

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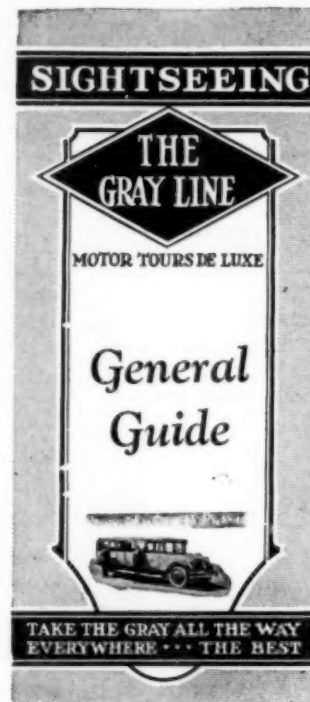
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Museums—Continued

SANTA FE, N. M.—Museum of New Mexico.

ALBANY, N. Y.—New York State Museum.

BUFFALO, N. Y.—Buffalo Society of Natural Sciences, Museum.

NEW YORK CITY—The Brooklyn Museum; American Museum of Natural History; Heye Foundation, Museum of the American Indian; Staten Island Institute of Arts and Sciences.

ROCHESTER, N. Y.—Municipal Museum.

TUXEDO, N. Y.—American Museum of Natural History, Station for Study of Insects.

CLEVELAND, OHIO—Cleveland Museum of Natural History.

PHILADELPHIA, PA.—Academy of Natural Sciences of Philadelphia; University of Pennsylvania Museum.

PITTSBURGH, PA.—Carnegie Museum.
READING, PA.—Reading Public Museum and Art Gallery.

PROVIDENCE, R. I.—Park Museum.

CHARLESTON, S. C.—The Charleston Museum.

SEATTLE, WASH.—University of Washington State Museum.

MILWAUKEE, WIS.—Milwaukee Public Museum.

HONOLULU, HAWAII—Bernice Pauahi Bishop Museum.

Landmarks—Continued

Santa Fé, New Mexico. This was the largest Indian village in the Southwest seen by Coronado in 1540; it was abandoned in 1838. The ruin has been partially excavated by the Phillips Academy, Andover, Mass.

The Santa Fé Transportation Co., (Fred Harvey management) Santa Fé, New Mexico, conducts an Indian Detour to the Rio Grande pueblo villages and to Frijoles Canyon, Puyé and other Rio Grande ruins; also a Sierra Verde motor tour, in season, to Pueblo Bonito, Mesa Verde, etc. Literature from railway companies or from Santa Fé headquarters.

The Inter-Tribal Indian Ceremonial at Gallup, New Mexico, August 20-31, 1928, is the annual exhibition of Indian dances and sports well worth seeing. Reservations at local hotels or through Secretary of the Ceremonial, should be made in advance.

For all ruins or pueblos in the Southwest, A. V. Kidder's "Introduction to Southwestern Archaeology," published by the Department of Archaeology, Phillips Academy, Andover, Mass., 1924, is by all odds the best reference.

CLASSICS OF SCIENCE:

Discovery of America *Geography*

You can here read the accounts of the most eventful days of Columbus' voyage as written up by Las Casas, a member of the expedition, from the Admiral's log.

PERSONAL NARRATIVE OF THE FIRST VOYAGE OF COLUMBUS TO AMERICA. From a manuscript recently discovered in Spain. Translated from the Spanish by Samuel Kettell. Boston, 1827.

We Set Sail

Friday, Aug. 3d, 1492. Set sail from the bar of Saltes at 8 o'clock, and proceeded with a strong breeze till sunset, sixty miles or fifteen leagues S. afterwards SW. and S. by W. which is the direction of the Canaries.

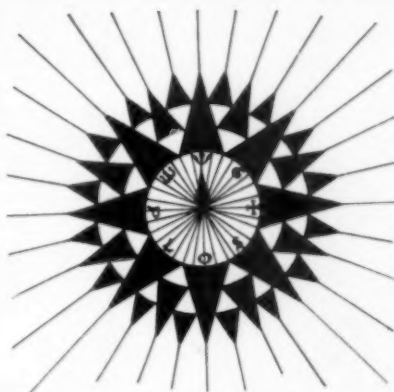
Monday, Aug. 6th. The rudder of the caravel Pinta became loose, being broken or unshipped. It was believed that this happened by the contrivance of Gomez Rascon and Christopher Quintero, who were on board the caravel, because they disliked the voyage. The Admiral says he had found them in an unfavorable disposition before setting out. He was in much anxiety at not being able to afford any assistance in this case, but says that it somewhat quieted his apprehensions to know that Martin Alonzo Pinzon, Captain of the Pinta, was a man of courage and capacity. Made a progress, day and night, of twenty-nine leagues. . . .

A Month Later

Sunday, Sept. 9th. Sailed this day nineteen leagues, and determined to count less than the true number, that the crew might not be dismayed if the voyage should prove long. In the night sailed one hundred and twenty miles, at the rate of ten miles an hour, which make thirty leagues. The sailors steered badly, causing the vessels to fall to leeward toward the Northeast, for which the Admiral reprimanded them repeatedly.

Monday, Sept. 10th. This day and night sailed sixty leagues, at the rate of ten miles an hour, which are two leagues and a half. Reckoned only forty-eight leagues, that the men might not be terrified if they should be long upon the voyage.

Sunday, Sept. 16th. Sailed day and night, W. thirty-nine leagues, and reckoned only thirty-six. Some clouds arose and it drizzled. The Admiral here says that from this time they experienced very pleasant weather, and that the mornings were most delightful, wanting nothing but the melody of the nightingales.



THIS "ROSE OF THE WINDS" COMPASS card dating from 1492 is probably like those carried on the NINA, the SANTA MARIA and the PINTA, which caused such consternation when they varied a whole point from true north. Columbus knew of the variation of the compass needle, and is said to have "corrected" the compass by shifting the card to allay the fears of his ignorant crew

He compares the weather to that of Andalusia in April. Here they began to meet with large patches of weeds very green, and which appeared to have been recently washed away from the land; on which account they all judged themselves to be near some island, though not a continent, according to the opinion of the Admiral, who says, "the continent we shall find further ahead."

Monday, Sept. 17th. Steered W. and sailed, day and night, above fifty leagues; wrote down only forty-seven; the current favored them. They saw a great deal of weed which proved to be rock-weed, it came from the W. and they met with it very frequently. They were of opinion that land was near. The pilots took the sun's amplitude, and found that the needles varied to the N. W. a whole point of the compass; the seamen were terrified, and dismayed without saying why. The Admiral discovered the case, and ordered them to take the amplitude again the next morning, when they found that the needles were true; the cause was, that the star moved from its place, while the needles remained stationary. At dawn they saw many more weeds, apparently river weeds, and among them a live crab, which the Admiral kept, and says that these are sure signs of land, being never found eighty leagues out at sea. They found the sea-water less salt since they left the Canaries, and the air

more mild. They were all very cheerful, and strove which vessel should outsail the others, and be the first to discover land; they saw many tunnies, and the crew of the Nina killed one. The Admiral here says that these signs were from the west, "where I hope that high God in whose hand is all victory will speedily direct us to land." This morning he says he saw a white bird called a water-wagtail, or tropic bird, which does not sleep at sea.

Saturday, Sept. 22d. Steered about W. N. W. varying their course, and making thirty leagues progress. Saw few weeds. Some *pardelas* were seen, and another bird. The Admiral here says, "this head wind was very necessary to me, for my crew had grown much alarmed, dreading that they never should meet in these seas with a fair wind to return to Spain." Part of the day saw no weeds, afterwards great plenty of it.

False Report of Land

Tuesday, Sept. 25. . . .

At sunset Martin Alonzo called out with great joy from his vessel that he saw land, and demanded of the Admiral a reward for his intelligence. The Admiral says, when he heard him declare this, he fell on his knees and returned thanks to God, and Martin Alonzo with his crew repeated *Gloria in excelsis Deo*, as did the crew of the Admiral. Those on board the Nina ascended the rigging, and all declared they saw land. The Admiral also thought it was land, and about twenty-five leagues distant. They remained all night repeating these affirmations, and the Admiral ordered their course to be shifted from W. to SW. where the land appeared to lie. They sailed that day four leagues and a half W. and in the night seventeen leagues SW. in all twenty-one and a half: told the crew thirteen leagues, making it a point to keep them from knowing how far they had sailed; in this manner two reckonings were kept, the shorter one falsified, and the other being the true account. The sea was very smooth and many of the sailors went in it to bathe, saw many dories and other fish.

Wednesday, Sept. 26th. Continued their course W. till the afternoon, then SW. and discovered that what they had taken for land was nothing but clouds. (Turn to next page)

Discovery of America—Continued

Sailed, day and night, thirty-one leagues; reckoned to the crew twenty-four. The sea was like a river, the air soft and mild.

The Crew Discouraged

Wednesday, Oct. 10th. Steered WSW. and sailed at times ten miles an hour, at others twelve, and at others, seven; day and night made fifty-nine leagues progress; reckoned to the crew but forty-four. Here the men lost all patience, and complained of the length of the voyage, but the Admiral encouraged them in the best manner he could, representing the profits they were about to acquire, and adding that it was to no purpose to complain, having come so far, they had nothing to do but continue on to the Indies, till with the help of our Lord, they should arrive there.

Thursday, Oct. 11th. Steered WSW.; and encountered a heavier sea than they had met with before in the whole voyage. Saw pardelas and a green rush near the vessel. The crew of the *Pinta* saw a cane and a log; they also picked up a stick which appeared to have been carved with an iron tool, a piece of cane, a plant which grows on land, and a board. The crew of the *Nina* saw other signs of land, and a stalk loaded with roseberries. These signs encouraged them, and they all grew cheerful. Sailed this day till sunset, twenty-seven leagues.

A Light and Land!

After sunset steered their original course W. and sailed twelve miles an hour till two hours after midnight, going ninety miles, which are twenty-two leagues and a half; and as the *Pinta* was the swiftest sailer, and kept ahead of the Admiral, she discovered land and made the signals which had been ordered. The land was first seen by a sailor called Rodrigo de Triana, although the Admiral at ten o'clock that evening standing on the quarter-deck saw a light, but so small a body that he could not affirm it to be land; calling to Pero Gutierrez, groom of the King's wardrobe, he told him he saw a light, and bid him look that way, which he did and saw it; he did the same to Rodrigo Sanchez of Segovia, whom the King and Queen had sent with the squadron as comptroller, but he was unable to see it from his situation. The Admiral again perceived it once or twice, appearing like the light of a wax candle moving up and down,

which some thought an indication of land. But the Admiral held it for certain that land was near; for which reason, after they had said the *Salve* which the seamen are accustomed to repeat and chant after their fashion, the Admiral directed them to keep a strict watch upon the forecastle and look out diligently for land, and to him who should first discover it he promised a silken jacket, besides the reward which the King and Queen had offered, which was an annuity of ten thousand maravedis. At two o'clock in the morning, the land was discovered, at two leagues distance; they took in sail and remained under the square-sail lying to till day, which was Friday, when they found themselves near a small island, one of the Lucayos, called in the indian language Guanahani. Presently they descried people, naked, and the Admiral landed in the boat, which was armed, along with Martin Alonzo Pinzon, and Vincent Yanez his brother, captain of the *Nina*. The Admiral bore the royal standard, and the two captains each a banner of the Green Cross, which all the ships had carried; this contained the initials of the names of the King and Queen each side of the cross, and a crown over each letter. Arrived on shore, they saw trees very green, many streams of water, and diverse sorts of fruits. The Admiral called upon the two Captains, and the rest of the crew who landed, as also to Rodrigo de Escovedo notary of the fleet, and Rodrigo Sanchez, of Segovia, to bear witness that he before all others took possession (as in fact he did) of that island for the King and Queen his sovereigns, making the requisite declarations, which are more at large set down here in writing. Numbers of the people of the island straightway collected together. Here follow the precise words of the Admiral. "As I saw that they were very friendly to us, and perceived that they could be much more easily converted to our holy faith by gentle means than by force, I presented them with some red caps, and strings of beads to wear upon the neck, and many other trifles of small value, where-with they were much delighted, and became wonderfully attached to us.

I thought then, and still believe, that these were from the continent. It appears to me, that the people are ingenious, and would be good ser-

vants; and I am of opinion that they would very readily become Christians, as they appear to have no religion. They very quickly learn such words as are spoken to them. If it please our Lord, I intend at my return to carry home six of them to your Highnesses, that they may learn our language. I saw no beasts in the island, nor any sort of animals except parrots." These are the words of the Admiral.

Christopher Columbus was born in Genoa, Italy, in either 1446 or 1451. He died at Valladolid, Spain, May 20, 1506. His first experience as a sailor was gained at the age of 14. He studied astronomy, and geometry at the University of Pavia. In early manhood he was in business in Genoa. Beginning in 1474, he made several sea voyages, and on one of them, when he visited England, he seems to have made a further trip to Iceland. About 1479, or perhaps as early as 1474, Columbus began to consider the possibility of reaching India by sailing west across the ocean. In 1482 Columbus submitted to King John of Portugal his proposition for attempting the new all-water route to the East. After that king had treacherously used Columbus' information to send out an expedition of his own on the enterprise, Columbus turned to Ferdinand and Isabella, the sovereigns of Spain. There followed many negotiations and much intrigue. After ten years' delay, Columbus, on April 17, 1492, received his authorization from the King and Queen. The outcome of the first of his four voyages is well known. The second voyage was begun in September, 1493, for the purpose of colonizing the newly discovered islands. Difficulties followed, as was inevitable. Columbus returned to Spain in 1495, and two years later made his third voyage to the new world. It was on that trip that he touched at the mainland of South America at the mouth of the Orinoco River. During his absence, returned colonists who were dissatisfied with affairs in the new colony got the ear of the King, and Bobadilla was dispatched to supersede Columbus. Bobadilla seized Columbus and his two brothers and returned them to Spain in irons. But before they reached the court, public sympathy had turned in their favor, and Bobadilla was recalled. He perished in a hurricane on the return trip, which was considered divine punishment. Columbus, still with the patronage and aid of the sovereigns, set out on his fourth voyage in 1502, and was gone two years. He returned broken in health, to live only two years longer. Although the proud Admiral always kept with him the fetters in which he was sent home in disgrace from his second trip, "as memorials of the reward of his service," he remained on good terms with Ferdinand and Isabella all his life, and his titles of Admiral and Duke of Veragua are still held by his descendants.

Science News-Letter, April 14, 1928

The Chinese tree of heaven, the *Ailanthus*, grew in North America hundreds of thousands of years ago, as is shown by fossil specimens in Colorado.

Rambling Around U. S. Observatories

Astronomy

Prepared by James Stokley, from information gathered on personal travels.

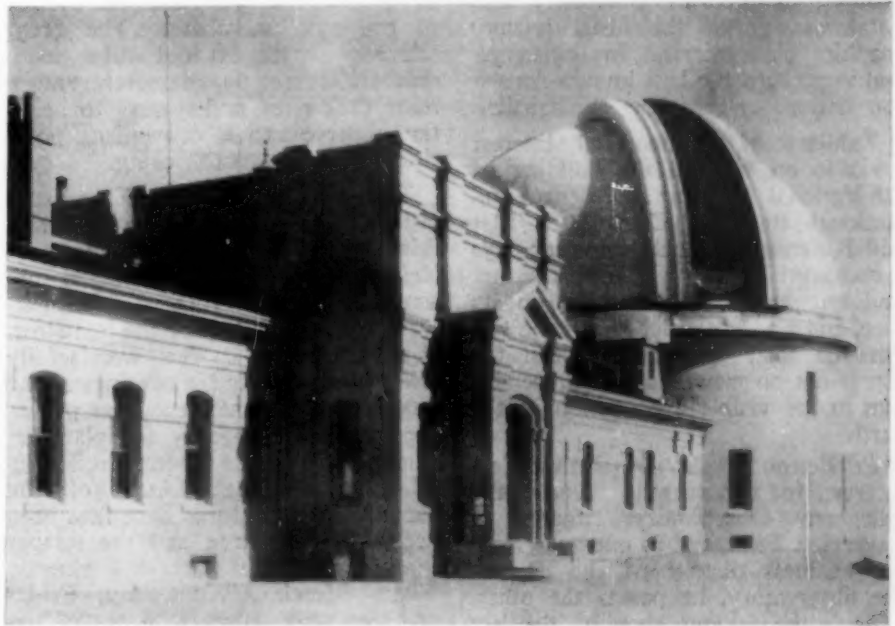
Astronomy in the United States is a relatively recent growth. A century ago there were no established observatories here, and so there are not the scenes and relics associated with earlier workers that can be found throughout Europe.

America is not entirely lacking in astronomical shrines, however, for in Colonial days there was one American astronomer of sufficient note that his fame extended even to Europe. This was David Rittenhouse, native of Philadelphia, whom the Royal Society of London honored by election to fellowship. He was a member, and in 1791 became president, of the American Philosophical Society. In the Society's quarters at Fifth and Chestnut Streets, *Philadelphia*, one of the buildings in the group including Independence Hall, home of the Liberty Bell, Rittenhouse's telescope, transit, and other instruments, are still preserved.

Another relic of Rittenhouse is to be found in the Provost's office of the University of Pennsylvania, at 34th St. and Woodland Ave. This is the orrery, or planetarium, to show the relative motions of the members of the solar system, constructed by Rittenhouse about 1770. At the time, this instrument attracted international attention. The machine has been repaired in recent years, and, once again, reveals the motions of the planets.

Turning to the modern observatories, the astronomical traveler of the United States might well start his tour near *Boston*, for the Harvard College Observatory, in *Cambridge*, is one of the most important centers of astronomy in the United States. Here one finds no great telescopes, though the 15-inch refractor in the dome on the roof of the main building was the largest in the world at the time of its erection some eighty years ago. Still in use, this venerable instrument nevertheless has a fascinating history, for with its aid the crepe ring of Saturn, as well as some of that planet's fainter satellites, was discovered; through it the Orion nebula was first studied in detail, and in the early fifties it was used for the first photograph ever made of a star.

A dozen or more other telescopes at the Harvard Observatory are in constant use recording the heavens night by night, which are supple-



LICK OBSERVATORY, on Mount Hamilton, near San Jose, California.

mented by photographs taken at the Observatory's southern station in South Africa. It is the file of thousands of negatives, some of direct photographs of the heavens, others made with the spectroscope, that is the observatory's greatest treasure.

Reached in a few hours' train ride from Boston, at *Springfield, Vermont*, are two things of astronomical interest. One is the turret telescope which its inventor, Hon. James Hartness, former governor of Vermont, has erected on the lawn of his home, and which connects by a tunnel with the house. On even a cold winter night, the observer can use this telescope in the comfort of a warm room.

The other interesting feature of Springfield is Stellafane, on one of the nearby hills. This is the astronomical club house where a group of employes of a large factory in the town gather with their home-made reflecting telescopes to watch the stars. It is the first of a number of groups of amateur telescope makers now springing up all over the country.

Philadelphia is of interest for the Rittenhouse relics, already mentioned. The Flower Observatory of the University of Pennsylvania, is located at *Highland Park*, Upper Darby, on the outskirts of the city, and is equipped with the 18-inch refracting telescope with which the late Prof. Eric Doolittle made his famous observations of

double stars. Not far away, at *Swarthmore*, is the Sproul Observatory of Swarthmore College, from which many eclipse expeditions to all parts of the world have been made, and where the determination of star distances is a specialty.

At *Washington* is the U. S. Naval Observatory, chiefly important because it is the source of correct time for the entire nation. Star observations every clear night serve to check the standard clocks, kept continually at a constant temperature in a subterranean vault.

Every day, except Sundays and holidays, interested visitors are shown around the Naval Observatory and their questions answered. On clear Thursday nights the 12-inch telescope is used to show visitors the sights of the heavens, but cards of admission must be obtained well in advance from the Superintendent of the observatory.

Not far from the Naval Observatory is the observatory of *Georgetown University*, on a hill in back of the University buildings. Founded in 1843, this is one of the oldest of American observatories, and it was here that Father J. C. Hagen, S. J., now director of the Vatican Observatory in Rome, did his classic work in preparing the *Atlas Stellarum Variabilium*. A 12-inch refracting telescope and a (Turn to next page)

Rambling Round the Observatories—Continued

12-inch photographic transit instrument are two of the chief instruments. Georgetown University also possesses one of the finest seismographic observatories in existence, and is perhaps the best known American station for recording earthquakes.

Exhibits of astronomical interest are also on view at the building of the National Academy of Sciences and National Research Council, at 21st and B Streets. Usually on clear days a coelostat telescope reveals the sun and any spots that may be on its face, and a spectroscope shows the visitor the solar spectrum. When the sun is not on view, a Foucault pendulum makes visible the rotation of the earth.

Pittsburgh is also of astronomical interest, for two reasons. One is the Allegheny Observatory, situated in Riverview Park, and as one goes from the business district of the city to the observatory, he passes the other. This is the famous shop of the late John A. Brashear, maker of many of the largest telescope lenses and mirrors, as well as several large mountings.

The 30-inch Allegheny telescope, largest in the East, is a photographic one, and is used mostly for measuring star parallaxes, from which are calculated their distances. The observatory also has a reflecting telescope of the same aperture. A smaller refractor, of 13 inches aperture, is used four nights a week for visitors to see the heavens. On cloudy nights, astronomical lectures are given.

The Yerkes Observatory of the University of Chicago is in Wisconsin, at *Williams Bay*, on the shores of Lake Geneva. This is about 90 miles north of Chicago. Here is located the world's largest refracting telescope, with a lens 40 inches in diameter. It was at Yerkes that Burnham carried out his classical measurements of double stars, that Barnard made his elaborate survey of star clouds in the Milky Way, and of the dark nebulae, and that comets have been discovered, the planets studied and the brightness and distances of stars measured. Beside the 40-inch telescope there is also the famous two-foot reflector, made by Prof. G. W. Ritchey, who later made the 60-inch Mt. Wilson telescope, as well as the optical parts of the 100-inch reflector.

Because of the pressure of time needed for research, no time is provided when the ordinary visitor can look through any of the telescopes.

Every Saturday afternoon, however, visitors are admitted to see the equipment, which is explained by one of the staff members. The great telescope, with 90-foot tube, in a dome 100 feet in diameter, and a floor that rises and lowers to bring the observer to a convenient position, are well worth seeing.

Traveling to the Pacific Coast, many visitors will go on the Santa Fé and this takes them through *Flagstaff, Arizona*, home of another famous observatory. This is the Lowell Observatory, established by the late Prof. Percival Lowell. The wonderfully clear sky over this plateau, more than 7,000 feet above sea level, has proved especially advantageous for planetary studies. With the 40-inch reflecting telescope and the 24-inch refractor planetary temperatures have first been accurately measured and the strange markings on Mars carefully charted. Every Monday, Wednesday, Friday and Saturday, from 1:30 to 2:30 p. m., visitors are shown the instruments, and the museum of astronomical photographs. By appointment made in advance, different hours and days can be arranged with the director.

From Flagstaff, after probably stopping at Williams, and taking the side trip up to the Grand Canyon, the tourist will eventually reach *Los Angeles*. At nearby *Pasadena* are the headquarters of one of the world's most important observatories, the Mt. Wilson Observatory of the Carnegie Institution of Washington. The offices, physical laboratory, shops and library are located here in the group of buildings at Lake and Santa Barbara Streets. On nearby *Mt. Wilson*, a mile higher, and visible from Pasadena, are the domes and towers of the telescopes. The astronomers spend a few days a month on the mountain, taking photographs, and then come back to Pasadena to study the plates.

The observatory proper, on Mt. Wilson, can be easily reached by a regular motor coach line from either Pasadena or Los Angeles. The Mt. Wilson Hotel at the summit, and adjoining the observatory, provides sleeping accommodations, if it is desired to stay over night. Every afternoon visitors are shown the various instruments of the observatory, including the 100-inch telescope, largest in the world, and a collection of astronomical photographs illustrating the work of the observatory. On Friday evenings the 60-inch telescope is devoted to showing visitors the

heavenly objects. Admission is free, but tickets must be obtained in advance at the Pasadena office of the observatory.

With perhaps the largest staff of any observatory in the world continually at work, the Mt. Wilson researches would require far more than a single brief article to mention.

Journeying northwards from Los Angeles, the astronomical tourist should stop at *San José*, where a motor coach can be obtained for *Mt. Hamilton*, location of the Lick Observatory of the University of California. Here is the world's second largest refracting telescope, with a lens 36 inches in diameter. This great instrument was the largest in the world when it was completed in the eighties, and the body of James Lick, the donor, lies buried under the pier of the great instrument. On top of the mountain is a complete community, where the astronomers live the year round.

Double star observations with the 36-inch telescope, studies with it of the spectra of stars, photographs with the 36-inch reflecting telescope, in another building, that have revealed thousands of faint nebulae and other remarkable objects, eclipse expeditions to various parts of the world—these are some of the activities for which the Lick Observatory has gained world-wide reputation.

No hotel accommodations are provided at the summit of the mountain, but visitors are admitted to view the instruments and astronomical photographs every day from 9:00 a. m. to 5:00 p. m. Every Saturday night visitors are permitted to look through the 36-inch refracting telescope at some typical celestial objects. Usually a smaller, 12-inch, telescope is also used to show other objects.

Still further north on the Pacific Coast, at *Victoria, B. C.*, is the world's second largest telescope, and the largest of the British empire. This is the 72-inch refractor of the Dominion Astrophysical Observatory. Americans may well feel proud of this instrument, however, for the great mirror was made in Pittsburgh and the mounting in Cleveland. This instrument is used chiefly in conjunction with the spectroscope, for measuring velocities of stars, and that very close type of double stars known as spectroscopic binaries, which even the largest telescope does not reveal as other than a single body.